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The role of Application of the universal precaution measures in the neonatal intensive care unit to decrease neonatalsepsis

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Abstract

Background: Neonatal sepsis refers to a group of physical and laboratory findings that occur in response to invasive infection within the first 30 days of life[4]. Applying of U.P.M in NICU may decrease the risk of neonatal sepsis. **Aim of the study:** This study aims to decrease mortality and morbidity from neonatal sepsis in the neonatal intensive care unit. **patients and Methods:** This study was conducted at NICU in Tikrit Teaching hospital. A representative sample of 223 neonates which admitted to neonatal intensive care unit in Tikrit hospital The sample is divided into two groups, *Group A* on which apply universal preventive measures for prevention of sepsis and *Group B* which remain on classic preventive measures. Follow-up of neonates by clinical examination, swabs from eyes, skin, and umbilical of new born and blood cultures to detect sepsis, omphalitis, conjunctivitis and skin infection. **Results:** The result of this study has indicated that the occurrence of sepsis after apply of U.P.M in NICU significantly decrease than before and the occurrence of omphalitis, conjunctivitis, and skin infection also significantly decrease. **Conclusion:** The use of U.P.M use of universal precaution measures are very effective in prevention of neonatal sepsis, omphalitis, conjunctivitis, and skin infection.

Keywords : universal precaution ; neonatal ; intensive care unit and sepsis

Introduction

Neonatal sepsis refer to group of physical and laboratory finding that occur in response to invasive infection within the first 30 day. Early onset infection present within 24 hours 82% ,5% present at24-48 hours, and smaller percentage of patients present between 48hours and 6 days of life. Onset is most rapid in premature neonates.Early-onset sepsis syndrome is associated with acquisition of microorganisms from the mother.[8]Transplacental infection or an ascending infection from the cervix, with acquisition of the microbe by passage through a colonized birth canal at delivery. [1]

Neonatal sepsis is a common cause of mortality in infants. The disease presents to pediatrician with a quite subtle findings, include mild apnea and temperature instability, yet can rapidly progress to fulminant organ dysfunction and death. Neonatal sepsis can be classified as congenital, early onset, and late onset, each differing by the mode of infection and the type of organism involved. There is still a significant mortality rate associated with neonatal sepsis. The microorganisms most commonly associated with early-onset infection include group B *Streptococcus* (GBS), *Escherichia coli, Haemophilusinfluenzae,* and *Listeria monocytogenes*[2,29]

The infant's skin, respiratory tract, conjunctivae, gastrointestinal tract, and umbilicus may become colonized from the environment, leading to the possibility of late-onset sepsis from invasive microorganisms. [3, 4]Vectors for such colonization may include vascular or urinary catheters, other indwelling lines, or contact from caregivers with bacterial colonization. [4]

Patients and Methods

Across section study conducted in neonatal intensive care unit(NICU) in Tikrit Teaching Hospital (TTH) in Tikrit city in Iraq, Neonate that deliver in the TTH which admitted to NICU were include in this study. Sample divided into two groups, *Group*

A(114 cases) on which we apply universal precaution measures (UPM) in addition to classic preventive measures that use in NICU from the binging of admission to the NICU to the time of discharge from hospital and *Group B* (109 cases) use only classic preventive measures and we asses and follow the neonate by clinical examinations swabs, and blood culture to detect neonatal sepsis, conjunctivitis, skin infection and umbilical infection(Omphalitis).

Swab was taken from each neonate admitted to NICU from the skin, eyes, and umbilicus send for culture at time of admission and then if he develop features of infection. A blood culture was done for neonates who have risk factors for sepsis or clinically suspected to have neonatal sepsis.

Universal Precaution Measure: This include participation and learn the staff of NICU how to apply these measures. These measures are:

- Wash hands by water and soap and then use of hand gel Chlorhexidinebefore and after touch of the neonate.
- Protect the eyes of the neonate from infection by wash it by clean water then apply tetracycline eye ointment daily.
- Washing the umbilical by clean water then apply gentian violet on it once daily.
- Cleaning the neonate product by sterile wet toil.
- Wear Clean and disinfect gloves with each interference.

Estimation of cases fatality rate(CFR): The cases fatality rate was estimated as the following:[13]

$$CFR=\frac{numberofdeathsduringaperiodoftimefromillness}{numberofpeoplewiththatillness}x100$$

Conventional statistical techniques were applied to the data in the study of distribution by frequency percentage and table representation nature of the association studies by application of statistical tests to measure the association by help of(chi) x^2 test with the value of P-value.

RESULTS

Table -1:The Distribution of Newborn According to Gender in Study Sample.

	Male		Female		Total	
	No	%	No	%	No	%
Group A	46	40.35%	68	59.65%	114	100 %
Group B	55	50.45%	54	49.55%	109	100 %
Total	101	45.30%	123	54.70%	223	100 %

In table (1) showed that from 114 cases, 46(40.35%) were males and 68(59.64%) were females in Group A whereas from 109 cases in Group B, 55(50.45%) were males and 54(49.54%) were females.(Table- 1)

Table-2: The Distribution of Sepsis According to the Application of UPM.

	Sepsis		No sepsis		Total	
	No	%	No	%	No	%
Group A	3	2.63%	111	97.36%	114	100%
Group B	10	9.17%	99	90.08%	109	100%
Total	13	% 5.82	210	94.17%	223	100%

In this table (2) showed the sepsis cases in Group A were 3(2.63%) cases out of 114 cases and the remaining cases 111(97.36%) had no sepsis, while in Group B out of 109 cases, 10(9.17%) had sepsis and the remaining 99(90.08%) were with no sepsis.

Table- 3: The Distribution of Omphalitis, Conjunctivitis and Skin Infection after application of Universal Precaution Measures.

Complications		Yes		No		Total	
		No	%	No	%	No	%
Omphalitis	Group A	1	0.87%	113	99.12%	114	100%
	Group B	6	5.50%	103	94.49%	109	100%
	Total	6	2.69%	217	97.30%	223	100%
Conjunctivitis	Group A	1	0.87%	113	99.12%	114	100%
	Group B	11	10.09%	98	89.90%	109	100%
	Total	12	5.38%	211	94.61%	223	100%
Skin Infection	Group A	_		114	100%	114	100%
	Group B	7	6.42%	102	3.57%	109	100%
	Total	7	3.13%	216	96.86%	223	100%

Table -3 showed frequency of omphalitis in the study sample was 2.69% (7 cases out 223), one case (0.87%) from Group A and 6 cases (5.5%) from Group B had omphalitis. The frequency of conjunctivitis in the study sample was 5.385%, one case (0.87%) from Group A and 11 cases (10.09%) from Group B had conjunctivitis. The frequency of skin infection in the study sample was 3.13%, all 7 cases (6.42%) were from Group B.

Figure(1):The distribution of case fatality in study sample .It was shown that after applying of universal precaution measures from 223 cases 30(13.45%)cases are die, while 193(86.55%) are alive

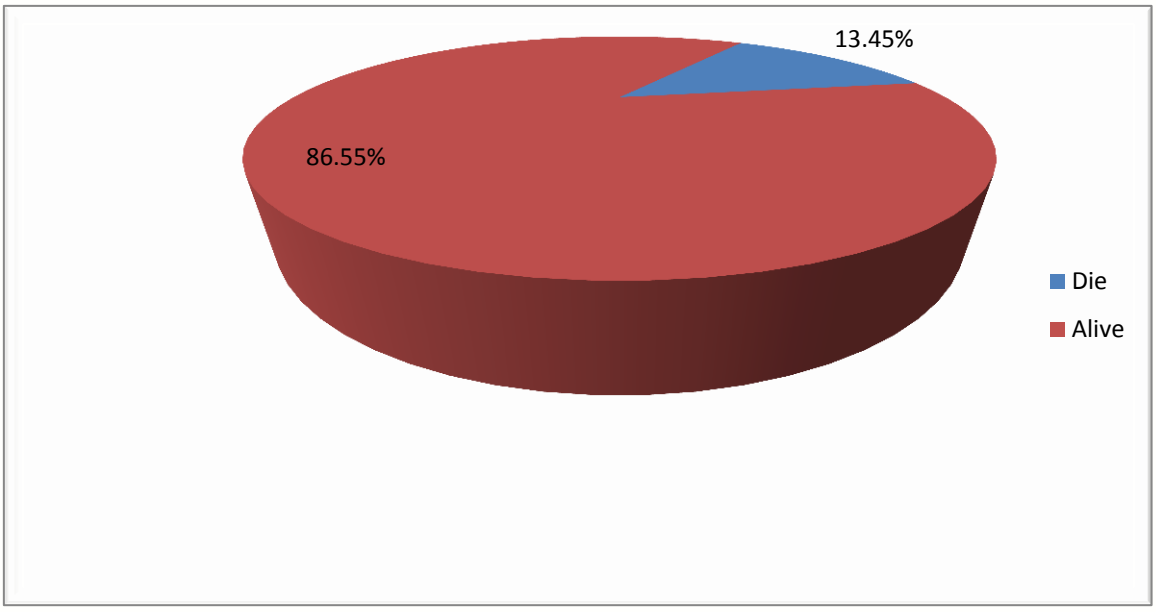

Figure -1:The distribution of death in the study sample.

Table -4:The Distribution of Death from Sepsis According to Application of Universal Precaution Measures.

	Die from sepsis		Die from other causes		Total	
	No.	%	No	%	No	%
Group A	2	11.76%	15	88.23%	17	100%
Group B	6	46.15%	7	53.84%	13	100%
Total	8	26.66%	22	73.33%	30	100%

Chi-square=4.61,DF=1 p-value at 0.05 significant

The distribution of death due to sepsis according to apply of UPM. It was shown that from 17cases die in group A 2(11.76%)cases die due to sepsis and 15(88.23%) die due to other causes. while in group B from 13 cases was die 6(46.15%) die from sepsis and 7(53.84%) of them die due to other causes (see table -4).

Table -5: The Distribution of Case Fatality Rate of Sepsis in Both Groups.

	Die		Alive		TOTAL	
	NO.	%	NO.	%	NO	%
Group A	2	66.66%	1	33.33%	3	100%
Group B	6	60%	4	40%	10	100%
Total	8	61.53%	5	38.46%	13	100%

Not significant

The distribution of cases fatality rate of sepsis in both group. shown that from 3cases had sepsis in group A 2(66.66%)cases were die and 1(33.33) were alive while in groupB from 10 cases had sepsis 6(60%) cases of them was die and 4(40%)were alive(as in table -5).

Discussion:

Neonatal infection common cause of death in neonates and children in the world. 1.6 million neonates die every year from infection in the neonatal care unit. Though most of these infections and deaths occur in the developing countries; neonatal sepsis remains a major cause of admission to neonatal intensive care units and mortality in the developed world.[8]

The study shown that the distribution of neonatal sepsis in neonatal intensive care unit is significantly decrease to (2.63%) after application of universal precaution measures , this in agreement with Boyer L [9] showed that use of universal precaution measures in the neonatal care unit decreased risk of early-onset disease in neonates and decreased neonatal febrile morbidity.

Also agreed with Mohle **K M** study [10] in a neonatal intensive care unit (ICU) in London was carried out to evaluate whether the incidence of infection in neonates receiving universal precaution measures was reduced in comparison to those who did not receive universal precaution measures which show significant decrease in the incidence of neonatal infection. [10]

But these result against the study of David Awhich shows no different between use of old and new precaution measures. [11]

There is significant relation between decrease in occurrence of neonatal omphalitis (0.87%) and application of universal precaution measures which agreed with the result of research of burke [12] from Indian has shown that, application of a topical antimicrobial to the cord stump reduces umbilical colonization by harmful bacteria .

Also agreed with Tomris T[13]he found that the apply a topical antimicrobial to the cord stump of neonate at birth and for the first three days to prevent umbilical colonization with pathogenic bacteria and cross-infections.

This study result also goes with Stronati M study[14] he conclude that application of topical antimicrobials on neonate cord stamp after birth until separation of cord is superior to just keeping the cord clean.

Ball MS study [15]also consist with this study result which shows, colored dye(like gentian violet) was found to be more effective in reducing umbilical colonization by staphylococcal ,streptococcal and other microorganisms in hospital nurseries than alcohol, hexachlorophene, bacitracin ointment and povidone-iodine. This study shown that frequency of conjunctivitis after application of universal precaution have been significantly reduced (0.87%) this result correspond to the result of Isenberg SJ and wood M A [16]study in which the conjunctivitis is reduced to (0.56%).

This study meets with Zuppa AA [18] he found no significant difference in the efficacy of silver nitrate, topical erythromycin and tetracycline prophylaxis in preventing ophthalmia neonatorum if use in the neonatal care unit after birth. Rouse DJ [19], found that the Prophylaxis with 1% Tetracycline eye ointment has not been significantly effective in prevention of neonatal conjunctivitis so this against the result of this study.

Obviously in this study the frequency of skin infection significantly was reduced (3.31%) after application of universal precaution measures this in agreement with Clemison J., & McGuire, W[19] Study which shown that the frequency distribution of skin infection decrease to(3.24%) after application of UPM . Also goes with Bowen JR[20]prospective study which was shown that the effect of washing the hands by chlorhexidine before and after touching of the neonate treating the skin of newborn was effective in preventing colonization and infection by Staphylococcus aureus. In contrast, the skin became profusely colonized by coagulase-negative staphylococci, if chlorhexidine not used.

There are no relation between risk factors and the distribution of neonatal sepsis in neonatal intensive care unit this due to the application of universal precaution measures in present study. This result goes with Tsai MH. study[21]and Oddie S study. [22] This study shown that all cases that develop of sepsis after application of universal precaution had risk factors for development of sepsis(100%) this agreement with Mil stone AM [23]also this result agreed with stud Polin RA . [24] Neonatal sepsis remains a major cause of mortality and morbidity in the newborn both in developing and the developed world. This is despite the advances in per natal and neonatal care and use of very potent antibiotics[25].

This study shows that the death from sepsis in the neonatal intensive care unit (11.76%) and from other causes (88.23%)after application of universal precaution these results are significant in agreement with study of Betty C, Yusuf [26]which show significant effect of application of UPM on the death from sepsis .

This result has agreed with You, D [27]which shows the infant death from neonatal infections in the neonatal intensive care unit has decreased steadily after the use of UPM,Cases fatality from sepsis in the neonatal intensive care unit after application of universal precaution measures (66.66%) this result insignificant same as result of Liu L.[28]

Conclusions

After applying of universal precaution measures in the NICU the occurrence of neonatal sepsis are significantly decrease(2.63%). Applying universal precaution

measures have greater rule in decrease the occurrence of omphalitis in neonate (0. 87%).There are significant relation between applying of new universal precaution measures and decrease frequency of conjunctivitis(0.87%). Skin infection also significantly decrease after application of universal precaution measures (no cases). There is significant relation between application of UPM and decrease death from neonatal sepsis in the NICU (11.7%).

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